



National Technical University of Athens Road Safety Observatory



#### Investigation of driver distraction effect using big data from smartphones

### **Panagiotis Papantoniou**

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Together with: George Yannis

# The DistrApp Overview

#### Title:

Investigation of driver distraction effect using big data from smartphones

#### **Operational Program:**

"Human Resource Development, Education and Lifelong Learning", within the action "Strengthen Postdoctoral Researchers - Second Phase" (MIS 5033021)

#### Duration:

➤ 2 years (2019 - 2021)

#### Co-financed:

State Scholarships Foundation (IKY)





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Ευρωπαϊκή Ένωση
European Social Fund
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Operational Programme Human Resources Development, Education and Lifelong Learning

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# Background

- Driver distraction is defined as "a diversion of attention from driving, because the driver is temporarily focusing on an object, person, task or event not related to driving, which reduces the driver's awareness, decision making ability and/or performance, leading to an increased risk of corrective actions, near-accidents, or accidents"
- Driver distraction may include four different types: physical, visual, auditory and cognitive
- Naturalistic Driving Experiments offer much wider perspectives in understanding normal traffic behaviour in everyday traffic situations





## Objectives

- Collection of a large-scale dataset consisting of unique high-quality data based on smartphones
- Assessment and improvement of key driving performance parameters (e.g. speeding, harsh accelerations/brakings, distance, duration, risky hours driving)
- Investigation and quantification of the effect of driver distraction on the overall driving behaviour and road safety
- Development of a set of driving profiles regarding different road and traffic environments



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# Methodological Challenges

- An innovative data collection scheme along with multi-modal trips, developed by the OSeven (oseven.io)
- Indicators from the mobile phone data process using:
  - Machine learning
  - Big data mining techniques
- Implementation of algorithms and statistical analyses
  - Descriptive analysis (correlation tables, boxplots)
  - Regression analysis (general linear mixed models)
  - Factor analysis (multiple factor analyses)
  - Latent analysis (structural equation models)





# **Experimental Framework**

- Naturalistic driving experiment
  - 100 participants
  - 1 month pilot period
  - 6 months driving period
- Road environment
  - Urban
  - Rural
  - Highway
- Driving behaviour questionnaire
  - Distraction-related driving habits
  - Attitude and behaviour toward road safety
  - Demographic characteristics





# Significant Findings

- Driver-related characteristics (e.g. gender, age, educational level, experience) play a significant role in overall driving performance
- Highest percentage of cell phone use is taking place on urban road network
- Distraction originating from cell phone use has a serious impact on the number of harsh events and subsequently on the relative accident risk
- Cell phone use is affected by specific driving characteristics, such as overall distance, duration, time of the day, speeding behaviour





Harsh events per mobile phone use





# Impact - Future Challenges

- Although automation affects significantly driving behaviour, distraction remains a key road safety issue with new aspects that arise
- Driver distraction and vehicle distraction will be for the next decades two major accident causes
- By the identification of risky distracted driving profiles, based on naturalistic driving behaviour data:
  - targeted enforcement strategies can be developed
  - targeted advanced assistance systems preventing driver distraction will be established by vehicle manufacturers



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